SECURING THE LODGMENT: AMC'S ABILITY TO SUPPORT A STRATEGIC BRIGADE AIRDROP

GRADUATE RESEARCH PROJECT

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Robert E. Jacobson

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Abstract

The purpose of this paper is to examine the Air Mobility Command's (AMC) ability to support a strategic brigade airdrop (SBA). A review of joint doctrine shows a continued reliance on the Airborne mission as a viable "Forcible Entry" option, yet AMC faces many problems meeting the needs of the Airborne forces and SBA mission. The imminent retirement of the C-141 aircraft coupled with the significant airdrop limitations of the new C-17 aircraft have severely hampered AMC's ability to support the SBA mission.

Using the principles of war as guidelines, I present two options that improve AMC's ability to effectively support Airborne forces. The first option maintains the traditional approach to delivering Airborne forces to their objective by employing the new C-130J-30 aircraft. The "stretch" C-130J with the addition of an air refueling receptacle has the capability to deliver the Airborne forces to their destination more effectively than a C-17 fleet. Further, the addition of the C-130J to AMC's airlift fleet allows more C-17 assets to support other concurrent operations.

The second option discards the traditional delivery method and takes an "out-of-the-box" approach to solving the strategic airdrop dilemma. This option involves dropping a platform from high altitude with the Airborne forces inside by using the Low-G Extraction Personnel Platform for Precision Air Drop (LEP^3ArD). This system provides a reliable, safe, and cost effective way of delivering Airborne forces into the objective area. Further, unlike the traditional airdrop methods, the LEP^3ArD system requires little training or coordination with airlift forces, dramatically increasing the flexibility of the Airborne forces.

SECURING THE LODGMENT:

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I. Introduction

> Strategic Brigade Airdrop is a specialized form of combat delivery that includes airdrop and airland insertion of a brigade-size complement of equipment and combat personnel over great distances. This capability supports the JCS requirement for an immediate response to deploy enmass airborne forces to combat zones throughout the world. Strategic Brigade Airdrop utilizes the concept of air direct delivery. Joint Pub 4-01.1 defines air direct delivery as "The strategic air movement of cargo or personnel from an airlift point of embarkation to a point as close as practicable to the user's specified final destination, thereby minimizing transshipment requirements." It allows the insertion of combat forces directly into battle or provides immediate resupply in areas where forcible entry is required. Direct delivery is the preferred method of delivery for forward operating forces in need of quick supply and for combat forces seeking the element of surprise and/or superior maneuver. (Air Mobility Master Plan, 1998:1-19)

The end of the cold war combined with the ever-shrinking defense budget of the 1990s has created drastic changes in the US military. The make-up of the US military changed from a forward presence force to a force projection force. The first step towards projecting our US forces overseas is to secure one or more lodgments that can accommodate our airlift and/or sealift assets. A lodgment is defined as a location that permits the continuous landing of troops/equipment either from aircraft or sea assets

(Draft Joint Pub 3-18, 1997:I-3). A secure lodgment allows the US military to safely and rapidly build up their required task forces to accomplish the mission.

To secure a lodgment, a Joint Force Commander has four possible "Forcible Entry" options (airborne, air assault, amphibious assault, and special operations) (Draft Joint Pub 3-18, 1997). Unlike the amphibious and air assault operations, the airborne and special operations capability can be quickly deployed from the continental United States (CONUS) to the objective area without utilizing an initial staging base close to the objective. The only airborne operation that has a "quick-strike" large-scale strategic capability is the SBA. This paper will focus on the SBA and the Air Force's ability to support this mission.

For the past three decades, the US military has relied on the C-141 Starlifter to perform strategic airlift and SBA missions. The retirement of the C-141, along with the initial problems with the C-17 Globemaster III aircraft, have severely hampered AMC's ability to support the SBA mission. As the number of overseas bases continues to dwindle, the US military must have the ability to rapidly establish airheads overseas to deploy its forces. If the airhead is held by enemy forces, the US must rely on military forces to secure the airfield. The only rapid response capability to counter a significant enemy threat at the airfield is the Airborne parachute assault (Draft Joint Pub 3-18, 1997). While the C-17 is an outstanding strategic airlift aircraft that can move outsize cargo to small austere airfields directly from the United States and provide superb capability to the Joint Force Commander, the lack of C-17 airframes along with the problems encountered dropping personnel from the newly developed aircraft have severely limited the

flexibility and capability of the Air Force to support a strategic rapid response airdrop mission.

Using the principles of war found in Air Force Doctrine as guidelines, this paper will focus on the problems the Air Force faces supporting the Airborne forces with a fleet of 120 C-17 aircraft. The paper examines the following question: what are the constraints impacting the Air Force's ability to accomplish a strategic brigade airdrop (SBA)? Three investigative research questions support the research. What guidance is available to validate the need for a SBA capability? What issues impact the Air Force's ability to support a SBA? What alternatives are available to support SBA according to the guidelines found in the principles of war and joint doctrine?

Chapter Two explores current joint doctrine to show the need and requirements to perform the strategic brigade airdrop mission. Chapter Three uses the guidelines found in the principles of war to show the limitations of solely relying on the C-17 to perform the airdrop mission. The training shortfalls that could inhibit our ability to accomplish a SBA mission are also discussed. Chapter Four presents two possible alternatives that would increase our capability to provide better service to the Airborne forces. One approach continues with the traditional delivery of Airborne forces and the second takes an "out-of-the-box" approach to increase our warfighting capability.

II. Defining the Need For SBA

Where Does the Strategic Brigade Airdrop Capability Originate?

Airborne Operations are defined in Joint Publication 3-18 as one of the four capabilities available to the Joint Chiefs of Staff to protect the Nation's vital interests as directed by the National Command Authorities. These four capabilities (amphibious assault operations, airborne operations, air assault operations, and special operations) force our enemies to think and fight differently, even if they are never used. The capabilities or options are used in conjunction with the term "Forcible Entry Operations". The definition of forcible entry is:

> The seizing and holding of a military lodgment in the face of armed opposition. A lodgment is a designated area in a hostile or potentially hostile territory that, when seized and held, will enable the continuous landing of troops and material, and provides space for subsequent operations. A lodgment may be an airhead, a beachhead, or a combination of both. A lodgment may have established facilities and infrastructure (such as those found at international air and sea ports), or may simply have an undeveloped landing strip, an austere drop zone, or an obscure assault beach. (Draft Joint Pub 3-18, 1997:I-3)

The operational applications of an airborne operation are extremely wide in scope. They can range from the initial phase of a campaign or operation (Operation JUST CAUSE) to a Coup de main (Operation URGENT FURY) (Draft Joint Pub 3-18, 1997:I-2). Forced entry operations can also employ as a single entity or in combination. Concurrent and integrated forcible entry operations occur when more than one of the four capabilities work simultaneously, either with separate operational areas (concurrent), or the same operational area (integrated).

While all four capabilities can be assigned to conduct a forced entry anywhere around the world, only the airborne operation and special operation capability can be quickly deployed from the Continental United States (CONUS) to the objective area without utilizing an initial staging base close to the objective. This "strategic" capability further enhances the elements of surprise for the operation. The special operation capability is used for short duration strikes and small-scale offensive actions. The only "quick strike" large scale strategic forced entry capability available to the Joint Chiefs of Staff is the strategic brigade airdrop (Draft Joint Pub 3-18, 1997).

Joint Vision 2010 and Army Vision 2010 also help define, albeit in an indirect way, the strategic brigade airdrop capability. Joint Vision 2010 states, "power projection, enabled by overseas presence, will likely remain the fundamental strategic concept of our future force" (Joint Vision 2010, 1996:8). Power projection is achieved through rapid strategic mobility, which will provide the timely response critical to our deterrent and warfighting capabilities. While Joint Vision 2010 stresses the improvement of information superiority and advances in technology, it also states that these advances will only enhance and not replace the ultimate need for "boots on the ground" in many operations. Dominant maneuver, precision engagement, full dimensional protection, and focused logistics are the new operational concepts defined in Joint Vision 2010. Table 1 shows the operational patterns defined in Army Vision 2010 and how they relate to the operational concepts found in Joint Vision 2010.

Table 1. Joint Vision 2010 and Army Vision 2010 (Neal, 1997:12)

Joint Vision Operational Concepts	Army Vision Operational Patterns
Dominant Maneuver	Project the Force Shape the Battlespace Decisive Operations
Precision Engagement	Shape the Battlespace Decisive Operations
Full Dimensional Protection	Protect the Force
Focused Logistics	Sustain the Force

Two concepts, dominant maneuver and focused logistics, are closely associated with SBA operations. Airborne forces meet the dominant maneuver requirement because they are adept at conducting sustained and synchronized operations from dispersed locations. The concept of dominant maneuver is to maintain a force that is agile and capable of moving quickly to deliver decisive combat power. Focused logistics not only involves combining information, logistics, and transportation technologies to provide rapid crisis response, but also includes delivering tailored logistics packages and sustainment packages directly to the desired location (Joint Vision 2010, 1996).

Why the United States Needs a Strategic Brigade Airdrop Capability?

The United States has employed military power over 270 times since 1945 in support of national objectives (Draft Joint Pub 3-18.1, 1997:I-1). A majority of these operations involved sending troops into underdeveloped countries. The United States dropped brigade size forces during operations URGENT FURY, JUST CAUSE, and was prepared to drop a brigade into Haiti for Operation UPHOLD DEMOCRACY. While some argue these operations did not occur far enough from the CONUS to fall under the strategic category, they did involve the use of a large portion of the Air Force's strategic assets (C-141Bs, KC-135s, and KC-10s). Additionally, most of the 270-plus missions

were contingency operations in which the time, forces available, and the operational areas were limited (Draft Joint Pub 3-18.1, 1997:I-1). The airborne divisions are normally the first forces considered for these operations if ground forces are needed to meet the requirements (Draft Joint Pub 3-18.1, 1997:I-1).

The strategic brigade airdrop capability provides the Joint Chiefs with an extremely flexible force. According to the draft of Joint Pub 3-18.1:

> Airborne forces provide the commander with the unique ability to quickly respond on short notice and mass rapidly on critical targets. Airborne operations are executed by specially trained forces and can be launched at a considerable distance away from the target area with such speed as to cause tactical or operational surprise and prevent effective reaction by the enemy. Airborne forces can secure critical installations, facilities or terrain; reinforce US and allied forces; or conduct a show of force. See Figure 1. (Draft Joint Pub 3-18.1, 1997:I-2)

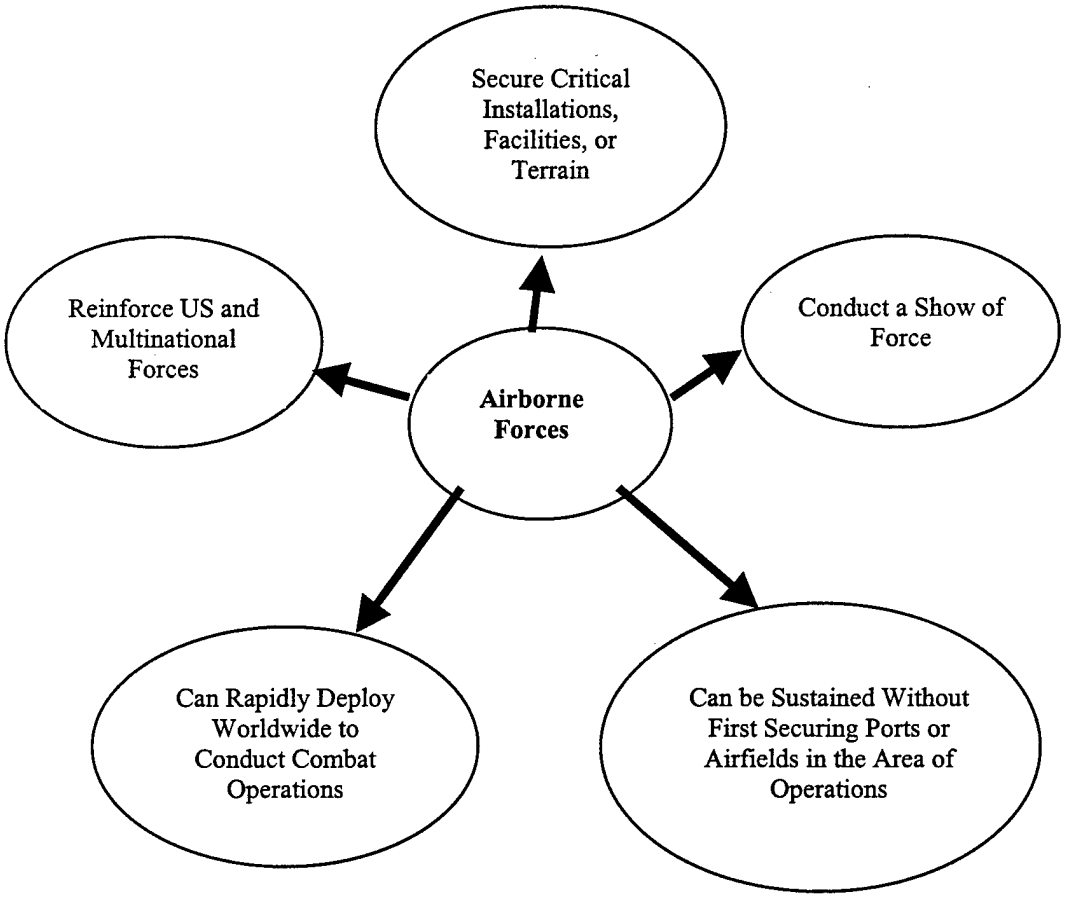


Figure 1. Airborne Operations (Draft Joint Pub 3-18.1, 1997)

Airlifting airborne troops onto foreign soil in response to a crisis provides an effective signal of US resolve. This orchestrated joint operation provides a strategic deterrent that is unmatched anywhere in the world (Draft Joint Pub 3-18, 1997). The Army's airborne forces, along with the Air Force's airlift and air refueling forces, are strategic assets that give the United States the capability of force projection through forcible entry. Historically, the simple alert or initial movement of airborne troops has proved a "show of force" with significant political ramifications. For instance, the deployment of the 82nd Airborne Division to Saudi Arabia during Operation DESERT SHIELD had serious political and psychological effects on the Iraqis. The impending arrival of the 82nd Airborne convinced the Haitian dictators to relinquish power during the initial stages of Operation UPHOLD DEMOCRACY.

Airborne forces can be deployed almost anywhere in the area of operations and fulfill a secondary role for the Joint Forces Commander--increased flexibility. Airborne forces provide a strategic reserve capable of securing vital areas or reinforcing other units. Overall, the airborne mission provides the United States with the following capabilities: world-wide show of force; seize and hold important objectives until linkup or withdrawal; seize an advance base to further deploy forces or to deny enemy use; reinforce units beyond the immediate reach of land forces; deny the enemy key terrain or routes; bypass enemy positions and terrain to achieve surprise; attack enemy positions from any direction; conduct or assist in Noncombatant Evacuation Operations (NEO) (Draft Joint Pub 3-18.1, 1997:II-4).

Ultimately, the preferred method would involve moving the required forces close to the objective and establishing an intermediate staging base. During Operation

RESTORE HOPE, Cairo West airfield was established as the forward staging base to employ forces into Somalia. Unfortunately, moving large forces into these forward staging bases can significantly reduce the element of surprise and the response time to the crisis.

How Does the Strategic Brigade Airdrop Work?

Strategic brigade airdrop operations are normally initiated by parachute assault into an area close to the objective. The parachute assault allows an army to mass troops and equipment faster than if it was brought in through airland operations. This holds true even with multiple landing zones available (Draft Joint Pub 3-18.1, 1997). The airborne forces are normally used to seize a base or terrain suitable for an advance base.

The strategic airborne operation is divided into four phases. The first phase, called the marshaling phase, entails the receipt of the planning directive up until the airborne forces are ready to deploy (Draft Joint Pub 3-18.1, 1997:II-5). The 82nd Airborne at Fort Bragg continuously has one of the three brigades assigned on standby. The brigade has 18 hours from notification to have all their equipment and personnel ready to load onto aircraft for departure (Kenny, 1998). This phase is complete when the aircraft are ready to depart.

The air movement phase is next and it incorporates the movement of loaded aircraft from the departure base to their drop zones or landing zones and then their movement back to the operating bases. The air movement phase also entails the movement of tanker support aircraft to assist in the airlift movement.

The airborne forces and equipment exiting the aircraft mark the beginning of the landing phase (Draft Joint Pub 3-18.1, 1997:II-5). Current Army guidance specifies the

parachute assault to be completed by the Air Force within 30 minutes. Usually, 4 hours after the parachute assault, the remaining brigade force begins arriving via airland and the entire brigade is in place within 24 hours (Thayne, 1997). When all the elements arrive at the objective area, the landing phase is complete.

When the first units land on the ground, the ground tactical phase is initiated. This phase incorporates the consolidation of units, the seizure of the initial objectives, and any subsequent operations. The phase ends when the mission is complete or the airborne force is extracted or relieved (Draft Joint Pub 3-18.1, 1997:II-6). The size of the airhead is dependent on the expected threat. Normally, if the mission is to secure an airhead for landing of follow-on forces, the airborne forces will establish a perimeter, approximately seven miles from the landing zone (Kenny, 1998). Once the airhead is established, the operation can progress to a defensive phase, an offensive phase, or a withdrawal or re-lift phase.

In support of US interests, we must have a force that is capable of deploying rapidly anywhere in the world. Specifically, the 82nd Airborne Division is the only US combined-arms force with the capability to conduct a forced entry and secure an area, while building enough combat power to fight, sustain itself and win the initial battle (Draft Joint Pub 3-18.1, 1997). Building combat power is the key concept. This can be achieved quickly by dropping an array of combat equipment, including artillery, anti-tank weapons, and service support items essential to sustain the force. Without the airdrop capability, it would take days or weeks to deliver an equivalent combat package from the US. Airborne operations will remain a vital method of forcible entry until an alternate method is developed. Any new option will require rapid reaction to global threats and

sufficient combat power to seize and secure the real estate required for follow-on forces (International Defense Review, 1989:413).

III. AMC's Limitations to Supporting SBA

Present and Future Strategic Brigade Airdrop Capability

There are a wide variety of missions that require the use of Airborne forces. Airborne forces can bypass land and sea obstacles and mass rapidly on critical targets, achieving surprise and bringing overwhelming combat power to bear. Airborne forces are dependent upon mobility assets for aerial delivery and resupply (Draft Joint Pub 3-18.1, 1997). To tie the diverse airborne missions to mobility requirements, the Army chose a medium-size Division Ready Brigade (DRB) to give it the greatest flexibility to move up or down in terms of size of force. The airdrop delivered force, or alpha echelon, and the follow on airland force, or bravo echelon, are shown in Table 2. The majority of the troops are deployed in the alpha echelon, while most of the support equipment and all the helicopters arrive in the next 24 hours as part of the bravo echelon.

Table 2. Alpha and Bravo Echelon Force Structures (Salice and Thayne, 1997)

Alpha Echelon (P + 30 min)	Bravo Echelon (P + 24 hours)
2,448 Troops	792 Troops
102 Wheeled Vehicles	227 Wheeled Vehicles
54 CDS Bundles	41 Pallets
18 Howitzers	16 OH58D Scout Helicopters
12 Eng Repair Packages	12 UH60L Blackhawk Helicopters
9 Supply Platforms	12 Eng Support Packages
	4 M1 Abrahms
	4 M2 BFV
	2 M113

The mobility requirement (airlift and air refueling) evolves from not only the size of the force package, but the distance to the objective and characteristics of the objective. The best scenario would allow the Air Force to merely airland the brigade into an area

close to the objective. The objective characteristics in a worst-case scenario are defined as a small austere airfield incompatible with C-141 and C-5 airland operations with a C-17 Maximum-on-Ground (MOG) of four and no organic air traffic control/cargo handling capability (Salice and Thayne, 1997). It is in this worst-case scenario that the Air Force faces many problems meeting the needs of the Airborne forces and the SBA mission. This paper focuses primarily on the insufficient number of C-17s to move the Bravo echelon force within 24 hours, the problems using the C-17 to drop personnel, and the lack of adequate training to accomplish the SBA mission.

Insufficient Number of C-17 Aircraft

The current airlift package required to accomplish a DRB medium consists of 23 C-141s dropping heavy equipment, 28 C-141s dropping personnel, and 20 C-17s dropping heavy equipment and CDS (container delivery system). All the C-17s in the Air Force inventory will then fly sorties to move the remainder of the force via airland into the objective (Salice and Thayne, 1997). Because of the insufficient number of C-17s to support the Bravo echelon through direct delivery, the airland portion cannot be completed within the required 24 hours of the initial airdrop. Figure 2 shows the number of hours to complete the direct delivery of the Bravo echelon forces from the US based on the current projected C-17 force by fiscal year. Until the Air Force has enough C-17s in its inventory (Fiscal Year 2004) to move the entire Bravo echelon force, the plan must be modified to use C-5s to carry the airland force to an intermediate staging base (ISB) close to the objective (Salice and Thayne, 1997). From the ISB, the C-17s will fly shuttle missions into the objective. If the Air Force can find a suitable ISB close enough that

will support the flow of airlift assets, the Bravo echelon force could reach closure within 24 hours.

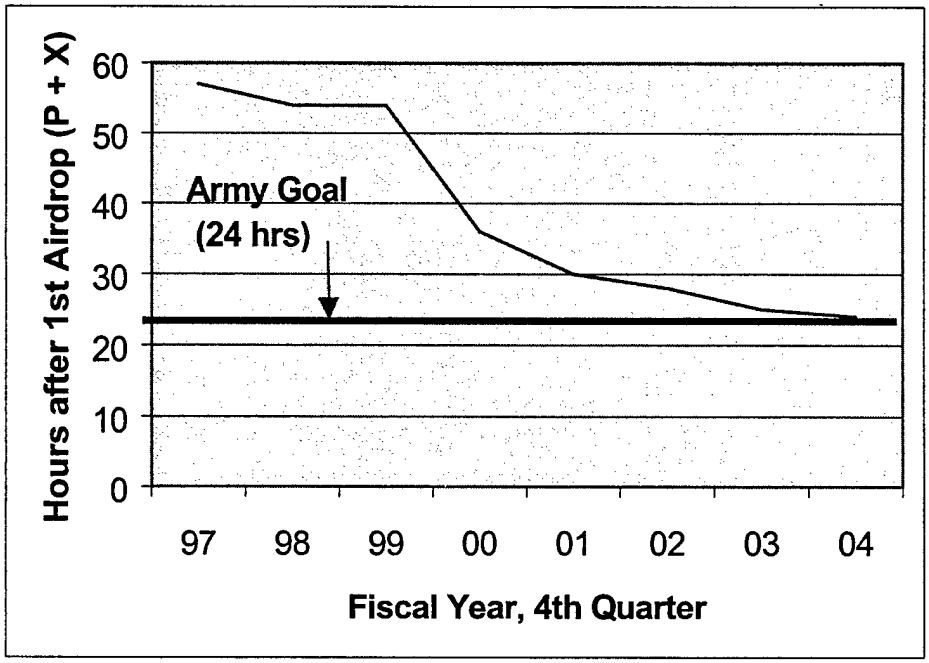


Figure 2. Bravo Echelon Force Closure Times (Salice and Thayne, 1997)

As the number of C-141s diminish, the C-17 will take on an even larger portion of the airdrop requirement. The C-141 will maintain the majority of the personnel airdrop requirement of SBA until its Primary Aircraft Authorized (PAA) drops below 28 in fiscal year 2002 (Table 3). By Fiscal Year 2002, the C-17 will be the only strategic mobility asset that can airdrop personnel or equipment in support of SBA (Petry, 1998).

Table 3. C-17 PAA Aircraft Through FY 2004 (Petry, 1998)

Aircraft Type	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04
SKE C141 (PAA)	78.00	65.00	54.00	40.00	32.00	7.00	0.00	0.00
C17 (PAA)	31.00	38.00	45.00	44.00	32.00	20.00	8.00	0.00
C17 Dual Row (PAA)	0.00	0.00	0.00	10.00	34.00	60.00	86.00	102.00

To successfully deliver the Bravo echelon in the first 24 hours, 58 C-17s are required to provide the direct delivery airlift from the US. The airdrop force will require 48 C-17s for heavy equipment/CDS and 24 C-17s for personnel (Salice and Thayne, 1997). The total SBA mobility package requires 130 C-17s. In 1995, the Defense Acquisition Board approved the procurement of 80 additional C-17s to bring the entire C-17 fleet up to 120 aircraft. The 120 C-17s will give AMC a C-17 PAA of 102 aircraft. The 102 aircraft is obtained by subtracting the eight aircraft in Air Education and Training Command (AETC) and the 10 aircraft (approximately 10% of the force) in depot (HQ AMC/XP, 1998). The 130 C-17s required is not only well above the Air Force's 102 C-17 PAA, but it even exceeds the total C-17 procurement of 120 aircraft. To reduce the C-17 requirement, the Air Force is currently conducting dual-row airdrop tests on the C-17. If successful, the C-17 requirement for heavy equipment/CDS will decrease by 18 aircraft. This capability decreases the total C-17 package below the 120 mark, but it still leaves the Air Force 10 C-17s over their PAA. Thus, to provide the Army with the mobility needed to successfully accomplish a strategic DRB-medium, AMC would have to recall all C-17s worldwide and also use all the C-17s from the guard/reserve and their training base at Altus (HQ AMC/XP, 1998).

The initial plan to resolve the Bravo echelon shortfall was to start training C-5 aircrews at Dover AFB in the airdrop mission. The C-5s used for the parachute assault would allow more C-17s to transfer to the airland role. The program was canceled because the Army did not want the platform used for their parachute assault force (Petry, 7 May 1998). In an attempt to reduce the number of C-17s required to support SBA, Air Mobility Command (AMC) reanalyzed the loading plans for the airland force and

determined they could reduce the number of required aircraft from 58 to 48. Also, AMC determined they could reduce the number of heavy equipment C-17s from 30 to 24 by placing airdrop loads on the ramp of each plane. The total C-17 requirement then drops to 96 aircraft. Based on a 96% reliability rate, the number of C-17s AMC is required to provide for support of the SBA mission becomes 99 (Petry, AMC/XPY, 7 May 98). Committing 99 of the Air Force's 102 C-17s to secure a lodgment, while feasible, does not provide the Air Force any flexibility to support any other concurrent operations. The time required to recall all the C-17s around the world and prepare them for the SBA mission greatly reduces our rapid response capability.

Personnel Airdrop Problems with the C-17

Another important problem with the Air Force's ability to support SBA is the C-17 personnel formation airdrop capability. During the initial stages of personnel airdrop testing, the C-17 had problems with paratrooper's drogue bags contacting subsequent jumpers as they exited the aircraft. This problem was overcome by extending the static line from 15 feet to 20 feet. Once the initial single-ship tests were completed, the aircraft was capable of dropping 102 paratroopers up to a maximum gross weight of 385,000 pounds. The next step involved examining a single element of three aircraft. After multiple tests, the geometry was changed from the C-141 geometry to the C-17 geometry to avoid problems encountered with wake vortices. Two problems arose with the new geometry, station keeping equipment (SKE) inadequacies and size of the drop zone (33rd Test, 1997).

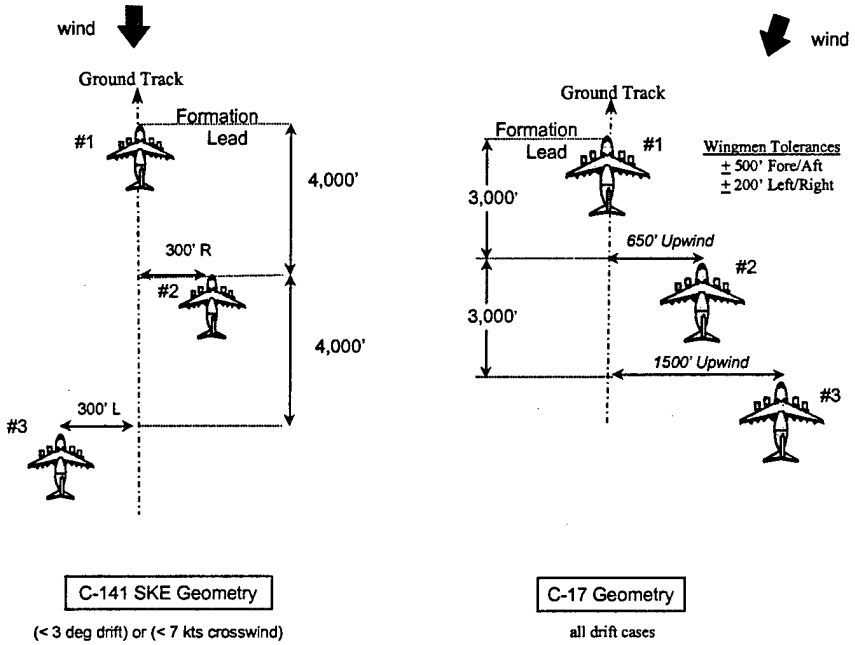


Figure 3. C-17 Three-ship Formation Geometry (33rd Test, 1997)

The SKE equipment on the C-17 is inadequate for monitoring aircraft position in the new geometry. The SKE cross track deviation indicator automatically switches scales based on the along track distance from the lead aircraft. The scale shown in Figure 4 shifts from 1,000 feet left/right to 2,000 feet left/right when the along-track distance is 5,000 feet or greater (number three aircraft). The diamond represents aircraft's deviation

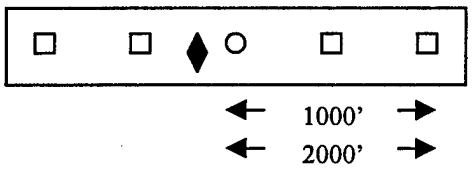
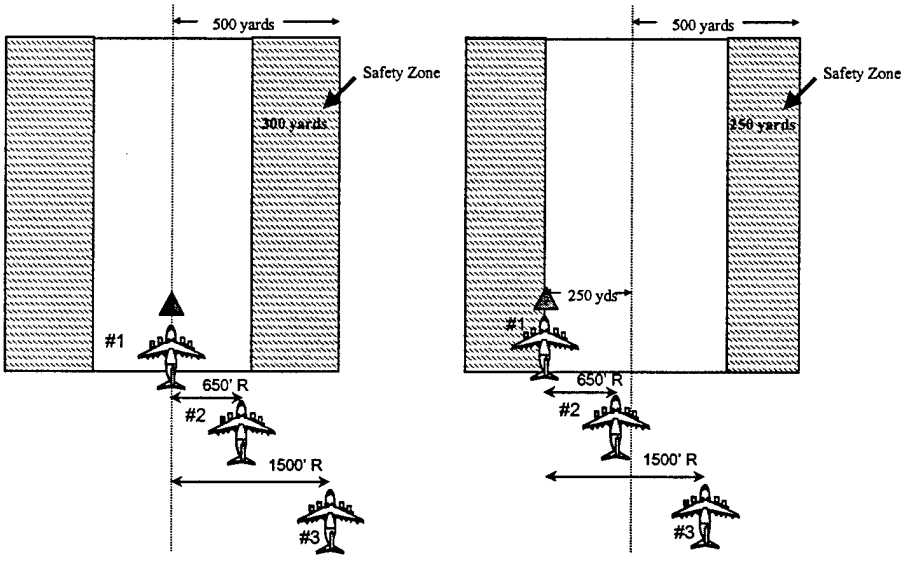


Figure 4. SKE Lateral Position Indicator (33rd Test, 1997)

from desired position. For the number two aircraft in the formation, the diamond indicates the aircraft is 200 feet right of position, for the number three aircraft, this same

indication tells the aircrew they are 400 feet out of position which is outside the C-17 tolerances of ± 200 feet. While this SKE indicator problem exists in the C-130 and C-141, the penalty for being out of position does not cause parachutes to deform or collapse.

The second problem with the new geometry is the size of the drop zone. As shown in Figure 5, the standard drop zone used by C-141/C-130 aircraft dropping personnel is 1,000 yards wide. The C-17 geometry would cause the number three aircraft (1500 feet lateral spacing from the lead aircraft) to fly down the lateral edge of the drop zone (Geometry A). In order to keep the 300 yard safety zone required by regulation, the drop zone size would have to be increased to 1600 yards wide. To decrease the drop zone back to 1,000 yards, the Air Force created offset PIs 250 yards left or right of



Geometry A Geometry B

Figure 5. Modified Drop Zone For C-17 Personnel Airdrop (33rd Test, 1997)

centerline based on winds and a reduction of the safety zone from 300 yards to 250 yards (Geometry B) (33 Test, 1997:36). The offset PIs require the aircrews to have very accurate knowledge of the winds around the drop zone prior to reaching the slowdown point (approximately 5 - 10 minutes out). If the winds shift during the final run-in, a "no-drop" will occur because the mission computer will not permit changes after the initial point is sequenced (33rd Test, 1997:28). A third problem with the new geometry is that the large crosstrack values with small tolerances (± 200' left/right) force aircrews to use SKE to maintain position for all personnel formation drops.

The next step was to move from three-ship to large formations of four or more aircraft. After multiple tests at Pope AFB, the wake vortices problem that affected the spacing within the three-ship element also affected the spacing between elements. When the tests were completed, the safe longitudinal distance between element lead aircraft moved from 6,000-12,000 feet to 40,000 feet (33rd Test, 1997:22). To put that number in perspective, by the time the fourth C-17 crosses the drop zone, 10 to 20 C-141 aircraft would have crossed the drop zone depending upon weather conditions. The time between three-ship elements in the C-17 formation to cross the drop zone is three minutes. In the first three minutes of the personnel airdrop, the C-17 will deliver 306 paratroopers compared with between 900 and 1800 paratroopers using the C-141 (Figure 6). The SKE system in the C-17 also has problems with the 40,000 foot spacing between elements because the maximum formation length is 10 nautical miles. Since each element is separated by approximately 6 1/2 miles, the entire formation length (24 aircraft) is over 42 miles long and therefore requires all four SKE frequencies (Salice and Thayne, 1997).

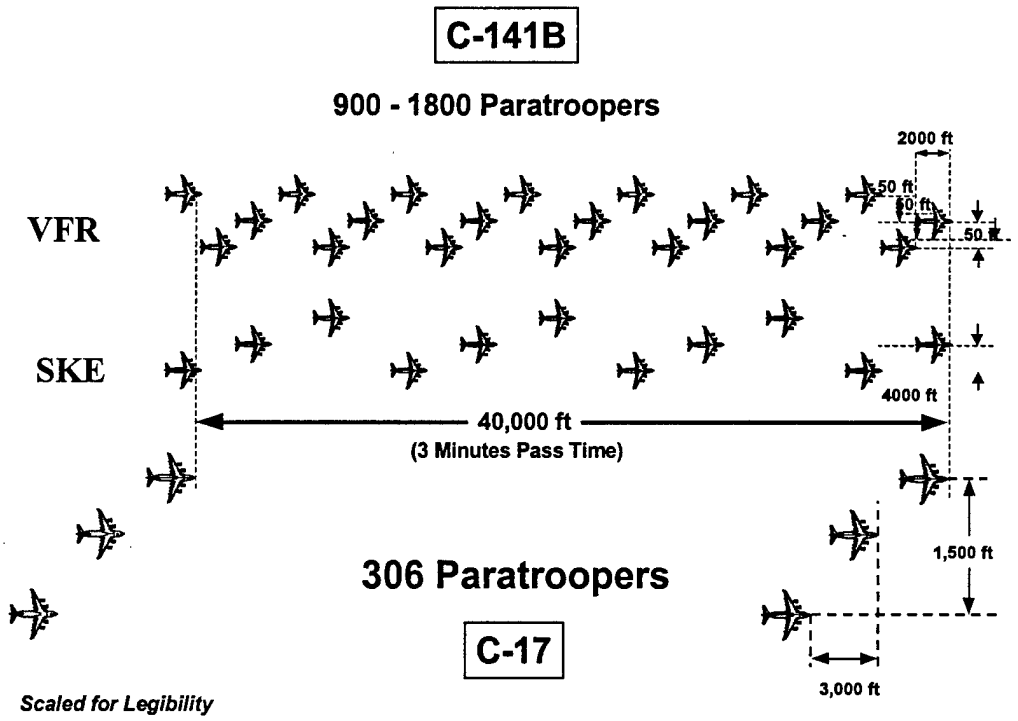


Figure 6. C-141B vs. C-17 Personnel Airdrop Formations (AMCR 55-141, 1992)

SBA Training Shortfalls

In 1990, after Operation JUST CAUSE, the Air Force identified the following training deficiencies in relation to conducting large parachute assaults: the aircrews are unfamiliar working with Airborne Command and Control Platforms (ABCCC and AWACS), aircrews are not qualified to fly with night vision goggles (NVGs), and they need more formation air refueling and anchor air refueling training (Kenny, 1998). Aircraft that drop heavy equipment/CDS platforms are not limited to a specific gross weight over the drop zone, so they could fly a significant distance from the objective either to a tanker or to a recovery base. Aircraft dropping personnel (C-141 or C-17) cannot fly more than approximately two hours at high altitude without receiving fuel

from a tanker or landing at a recovery base. The time and distance decreases if the formation is required to fly low level egressing after the airdrop.

Aircrew training in support of the SBA mission is still lacking, particularly in the air refueling and command and control arenas. In 1992, McChord lost two C-141s during a night formation air refueling when proper procedures were not followed. AMC suspended all formation air refueling except for the basic procedure of two receivers on one tanker and no refueling was permitted unless flying straight and level. Over four years later, the procedures were finally altered to allow up to three airlifters to receive fuel from up to three tankers. These limitations create problems for SBA by forcing formations to split up into three-ship elements prior to refueling and then rejoin the elements once the air refueling is complete. Typically, air refueling operations organized close to the area of operations are conducted in air refueling anchors. These anchors are basically racetracks in the sky that the tankers fly waiting for their receivers to come and get the gas. The anchor tracks allow the planners to put a large group of tankers in a small airspace separated vertically and horizontally. Anchor tracks currently cannot be used when planning on refueling multiple airlifters in formation because the AMC's guidelines prohibit multiple aircraft refueling with tankers in anchor tracks (AMCR 55-141, 1993).

The tactical aircrews also rarely work with airborne command and control (ABCCC) platforms during large-package training exercises. Most aircrews only experience working with ABCCC during "flag" exercises which emphasize fighter tactics, not large airdrop formations.

Every month, at least 12 strategic aircraft come together for a 4 day Joint Airborne/Air Transportability Training (JA/ATT) exercise. While the aircrews gain experience in leading and flying in large formations, tanker or ABCCC assets are rarely involved. The profiles are normally designed to give maximum training to the Airborne forces. The aircrews fly a one hour low-level route to a local drop zone, drop the Airborne forces, then recover to Pope AFB to load more personnel/equipment. An annual exercise "Big Drop", involves over a hundred aircraft dropping at least an Airborne brigade-size force on one or more objectives. Again, these exercises fall well short in the training aspect of what would be accomplished on an actual SBA mission. The enroute portion may include a high level route to a low level route similar to a SBA mission, but does not involve air refueling enroute before or after dropping the forces on the objective. The exercise does not require the Air Force to provide augmented airdrop aircrews nor does it include all the airland follow-on forces needed to hold the airhead. Further, the exercises do not involve aircrews under control of ABCCC platforms to practice coordinating their airlift package with other possible aircraft normally involved with securing a lodgment.

A majority of these training shortfalls can be directly linked to the declining military budget. The training shortfalls combined with present and future assets that cannot meet either the airdrop force closure time (P + 30 mins) or the airland force closure time (P + 24 hours) significantly deter our ability to perform the SBA mission.

SBA and the Principles of War

To help focus on the particular problems the Air Force faces in supporting the SBA mission, the principles of war will be used as guidelines. The principles of war

apply equally to all US military forces and serve as guidelines that commanders should use to form and select a proper course of action. The principles are not all-inclusive but provide a basis for judgment in employing Airborne forces. The principles of war include unity of command, objective, offensive, mass, maneuver, economy of force, security, surprise, and simplicity (Air Force Doctrine Document 1, 1997:11).

How do the current capabilities of the Air Force to support a SBA mission and our near-term solution using an all C-17 fleet conform to the principles of war defined in our Air Force Basic Doctrine?

Unity of Command: Unity of command ensures the concentration of effort for every objective under one responsible commander. This principle emphasizes that all efforts should be directed and coordinated toward a common objective. (Air Force Doctrine Document 1, 1997:12)

The strategic brigade airdrop mission follows the unity of command guidance by requiring a mission commander to fly as an additional crewmember on all missions that employ over six aircraft in a formation. The Army commander, normally of much higher rank than the Air Force mission commander, does not have authority over operations until the Airborne forces hit the ground.

Objective: The principle of objective is concerned with directing military operations toward a defined and attainable objective that contributes to strategic, operational, or tactical aims. (Air Force Doctrine Document 1, 1997:13)

The purpose of a parachute assault force is to secure a lodgment to allow the build-up of forces. Once the build-up of sufficient forces occurs, the forces can then project themselves from the lodgment to accomplish the mission objectives. Airdrop operations therefore have a defined objective (secure the lodgment) that contributes to the overall strategic and operational aim.

Offensive: The principle of the offensive holds that offensive action, or initiative, provides the means for joint forces to dictate battlespace operations. Offensive is to act rather than react and dictates the time, place, purpose, scope, intensity and pace of operations. The initiative must be seized as soon as possible. (Air Force Doctrine Document 1, 1997:14)

While the strategic brigade airdrop is offensive by nature, the lack of adequate airlift assets prevents the US military from seizing the initiative within the desired parameters. The parachute assault force gains the initiative by dropping troops and equipment in a very short period of time (the Army desires less than 30 minutes). Using a mix of C-141 and C-17 aircraft, the parachute assault force can be on the ground in less than 15 minutes. The initiative of the airland forces projecting out from the airfield does not meet current guidelines due to the lack of C-17s in the Air Force inventory (see Figure 2). In 2003, when the Air Force begins using an all C-17 airlift force to accomplish SBA, the closure time for dropping the parachute assault force more than doubles. The time to drop the 2,448 paratroopers alone increases from just under 5 minutes to 24 minutes, which could affect the Airborne force's ability to seize the initiative and secure the lodgment for the airland flow. When the 120th C-17 is delivered to the Air Force, the airland force should reach the lodgment within the desired 24 hours.

Mass: The principle of mass calls for concentrating combat power at a decisive time and place. Concentration of military power is a fundamental consideration in all military operations. Generally, surface forces must mass combat power before launching an attack at the objective. The airman's perspective of mass must also include airpower's ability to assist in the massing of lethal and non-lethal surface forces. (Air Force Doctrine Document 1, 1997:16)

One of the keys for successful parachute assault on an objective is to quickly mass a significant amount of paratroopers on the drop zone. The Air Force currently has this capability with the C-141, but when the C-17 takes over the personnel airdrop, the

amount of mass on the drop zone in the first 3 minutes drops from 1800 paratroopers to 306.

Maneuver: The principle of maneuver calls for action to place the enemy in a position of disadvantage through the flexible application of combat power. Air maneuver allows engagement almost anywhere, from almost any direction, thus forcing the adversary to be on guard everywhere. Airlift is extremely agile in maneuvering ground forces to achieve military mass. (Air Force Doctrine Document 1, 1997:17)

The entire concept of strategic brigade airdrop is to maneuver ground forces to achieve military mass at the drop zone. The current capability falls short in the ability to move the desired mass required by the 82nd Airborne within the initial 24 hours. If the dual row airdrop testing on the C-17 is successful and the Air Force procures all 120 aircraft, it must dedicate almost the entire C-17 fleet, (99 of the 102 PAA) to maneuver the forces to the objective. Up until FY 2004, the Air Force will not have the airlift assets available to accomplish the movement of forces within the allotted time.

Economy of Force: The economy of force principle calls for the rational use of force by selecting the best mix of combat power. This principle responds precisely to the greatest vulnerability of air and space power employment: the misuse or misdirection of air and space power. (Air Force Doctrine Document 1, 1997:18)

The 82nd Airborne has based their airborne forcible entry option on the medium-size division ready brigade which has been further divided into airdrop and airland force packages. The predetermined size of the employment force allows the Air Force to determine the number of airlift and air refueling assets required to perform the mission.

Security: The principle of security requires that friendly forces and their operations be protected from enemy action that could provide the enemy with unexpected advantage. This principle also enhances freedom of action by reducing the vulnerability of friendly forces and creating opportunities to strike the enemy where least expected. (Air Force Doctrine Document 1, 1997:18)

As with most forcible entry options, the US forces involved are the most vulnerable during the initial stages of the operation. The US relies on airspace

superiority to not only prohibit enemy air assets from attacking the airlift group, but to also deter any ground threats that may be encountered. The enemy air assets are much easier to control than the enemy ground threats. The aircraft performing the airdrop mission are the most vulnerable immediately prior to and when performing the actual drop of personnel and equipment. While the Air Force would like to eliminate all ground threats around the drop zone, realistically, they can only hope to suppress the threat and use the principle of surprise to allow the airdrop aircraft safe passage over the drop zone. Using the C-17 aircraft to drop personnel, the Air Force mission becomes much more difficult because it now must suppress the enemy ground threat for a much longer period of time. The ground threat is more significant now due to the worldwide proliferation of hand-held surface-to-air missiles. To reduce the vulnerability, the exposure time across the drop zone must be kept to a minimum.

Surprise: Surprise leverages the security principle by attacking at a time, place, or in a manner for which the enemy is not prepared. The speed and range of air and space forces, coupled with their flexibility and versatility, allow air forces to achieve surprise more readily than surface forces. (Air Force Doctrine Document 1, 1997:20)

When the Rwandan government forces, comprised of Hutu tribe members, began killing their minority rival Tutsi countrymen in 1994, they realized that the West might try to intervene and send relief to the surviving Tutsi men, women, and children. During the initial stages of the civil war, the Hutu forces knew how to hinder the West from aiding the Tutsis; they took control of the lodgment by seizing Rwanda's only major airport (Tata, 1996:82). In situations where a country has very few airports for US forces to establish a lodgment, the Airborne forces must be able to respond quickly to the crisis or locate another drop zone away from the airfield and then attack the lodgment over land. The reliance on using all C-17 assets in the Air Force inventory to accomplish the

SBA mission reduces our ability to quickly respond to the crisis. The increasing worldwide media coverage also greatly inhibits the Air Force's ability to surprise the enemy at the desired objective. The longer the US waits to respond to a crisis, the more time the enemy has to increase the threat level at the airfield.

Simplicity: Simplicity calls for avoiding unnecessary complexity in organizing, preparing, planning, and conducting military operations. This ensures that guidance, plans, and orders are as simple and direct as the objective will allow. (Air Force Doctrine Document 1, 1997:21)

The current SBA strategy is a very complex plan, especially with the execution of moving the airland forces to the airfield. The plan involves establishing an initial staging base close enough to the area of operations that can accommodate C-5 aircraft. The C-5s will move a majority of the Bravo echelon force to the initial staging base where the equipment and passengers will then be transferred to a C-17 for transportation into the lodgment. The reduced forward presence overseas by the US military increases the chances that the initial staging base will not be a preexisting US installation, so logistics support equipment will have to be delivered prior to the operation. If the Air Force can allocate 48 C-17s to deliver the Bravo echelon for the lodgment, it can simplify the operation. If the C-17 is used for personnel airdrops, the parachute assault operation becomes more complex, requiring the use of multiple SKE frequencies for the formation and establishment of offset points of impact on the drop zone depending upon crosswind conditions.

By increasing the number of C-17s assets available to accomplish the support of the airland forces into the lodgment, the Air Force can improve the principles of surprise and maneuver. The problems with the C-17 formation geometry during personnel airdrops effect the Air Force's ability to follow the other principles of war. The next

section discusses two options that improve our capability to drop personnel in large formations and allocate more C-17 assets to aid in the delivery of the airland forces.

IV. Alternative Solutions to Increase the SBA Capability

There are several solutions the Air Force can pursue to provide better support for the Army in the SBA mission. This section will examine two possible solutions: procure the stretch C-130J aircraft to accomplish some or all of the drops for the Airborne brigade, or develop the Low-G Extraction Personnel Platform for Precision Air Drop (LEP^3ArD) to be delivered by C-17 aircraft at high altitude. The first solution maintains the current philosophy of delivering troops and equipment via a low level ingress to the drop zone. The last solution takes an "out-of-the-box" approach to dropping a brigade-size force on an objective.

Stretch C-130J

One option that would improve Air Force support of the SBA mission is to procure the C-130J-30 (stretch version). With the retirement of the C-141 and cancellation of the C-5 airdrop program, the C-17 remains the Air Force's sole strategic asset to support the 82nd Airborne. Enter the new stretch version of the C-130J Hercules. The stretch model, designed by Lockheed Martin, comes from the same mold as the current C-130s. Lockheed Martin has added new six blade Allison AE 2100D3 engines that dramatically increase performance over the old C-130 airframes. The C-130J, complete with advanced, up-to-date avionics, also reduces the required number of crewmembers from 5 down to 3 (Dillingham, 1998). The weakest link in an all C-17 SBA is the C-17's inability to drop large numbers of paratroopers effectively. One option would be to give the personnel airdrop role to the new C-130J-30. The stretch C-130J has the capability to drop up to 92 paratroopers without the wake vortices problem

of the C-17, allowing five times the mass on the drop zone in the same amount of time (Figure 7).

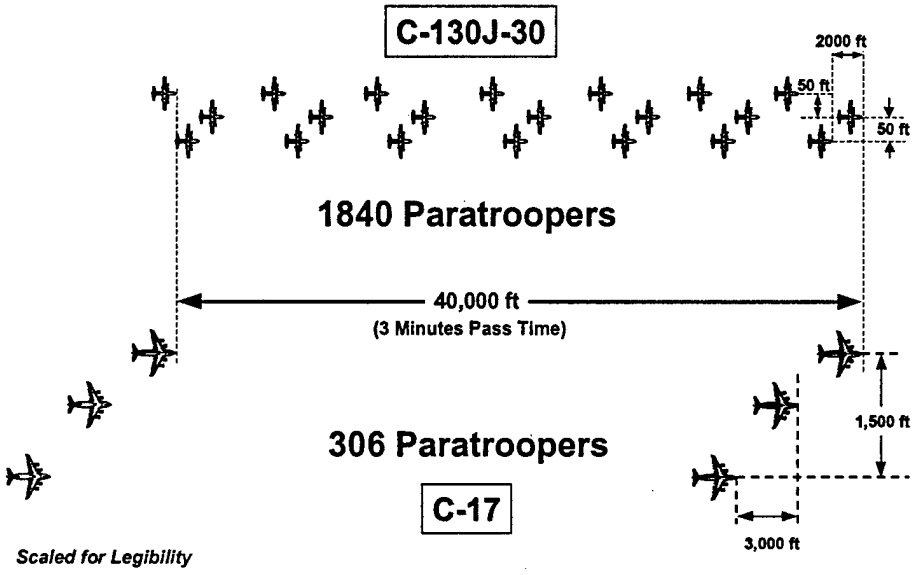


Figure 7. C-130J-30 vs. C-17 Personnel Formation Airdrop (Dillingham, 1998)

The C-130J does not require SKE to drop personnel. If the weather dictates the use of SKE, the entire formation could operate under one SKE frequency. A combination of C-17s with dual-row capability dropping heavy equipment followed by stretch C-130Js dropping paratroopers could complete the parachute assault phase in under 11 minutes (Salice and Thayne, 1997). Lockheed Martin is offering an air refueling package that will allow the C-130J-30 to fly from the continental US to anywhere in the world non-stop. The only detriment to the C-130J-30 is the slower airspeed versus the C-17. However, other characteristics of this dynamic platform easily make up for this shortfall. Table 4 shows the differences between the C-130J-30 and the C-17.

Table 4. C-130J-30 Capabilities vs. C-17 Capabilities (Thayne, 1998)

	C-130J-30	C-17
Formation Airspeed	330 KTAS	415 KTAS
Maximum Fuel Capacity	43,000 lbs	180,000 lbs
Average Burn Rate	4,200 lbs/hr	20,000 lbs/hr
Maximum Paratroops	92/80*	102
# Aircraft Required	27/31*	24

* number of paratroopers on board for comfort on long flights

For an objective located 5,000 miles from the US, the C-17 fleet would take 12 hours to reach the objective compared with 15 hours for the C-130J-30. The C-17 fleet of 24 aircraft would burn 5.76 million pounds of fuel compared with 1.72 million pounds for the 27 C-130J-30 fleet. By decreasing the amount of fuel by almost one-fifth, AMC can significantly reduce the number of air refueling assets needed to support SBA. Assuming each KC-135 tanker offloads 80,000 pounds of fuel, the difference between the two formations is 50 tanker sorties.

Not only does the C-130J-30 require fewer tankers enroute to the objective, it does not require tanker support shortly after completing the airdrop. The C-17 maximum gross weight across the drop zone is 380,000 pounds. With 102 paratroopers on board, the C-17 maximum fuel capacity across the drop zone is 67,000 pounds which equates to approximately 2 hours flight time before refueling. The C-130J-30 does not have a maximum gross weight across the drop zone and could fly an additional eight hours or more before needing to refuel or land (Girtman, 1998). This capability further reduces the number of tankers required to support the securing of the lodgment.

The cost of procuring C-130J-30s is approximately $55 million apiece (Lowe, 1998). To purchase the 45 C-130J-30s for Pope AFB, the total cost becomes $2.475 billion. Two factors to consider when analyzing the cost are the current age of the C-

130E fleet and the savings achieved in day-to-day operations over both the current C-130E model and the C-17. The entire C-130 fleet is not equipped to meet the DoD mandated navigation safety requirements or the emerging Global Air Traffic Management (GATM) requirements. The Air Force Navigation and Safety Master Plan directs all passenger and troop carrying aircraft to have 4th Generation Ground Collision Avoidance Systems (GCAS), Traffic Collision Avoidance Systems (TCAS), and GPS. The current C-130 fleet does not have the latest generation GCAS or a GPS that meets the navigation safety requirements, and only one-seventh of the fleet has TCAS installed (HQ AMC/XPY, 13 Jan 1998). Initially, estimates showed 140 aircraft will reach their service life by 2020. The service life model has been adjusted due to unexpected structural and corrosion problems. The new model shows that 150 aircraft will reach their service life in 2008 versus 2020 as initially planned (Figure 8). These current problems may require the Air Force to look at C-130Js earlier than expected to replace current tactical airlift force. If the Air Force is replacing 150 of the oldest C-130E models with C-130Js, an additional $5 million per aircraft would not only replace the C-130E, but add an SBA capable strategic asset to the Air Force inventory (Lowe, 1998).

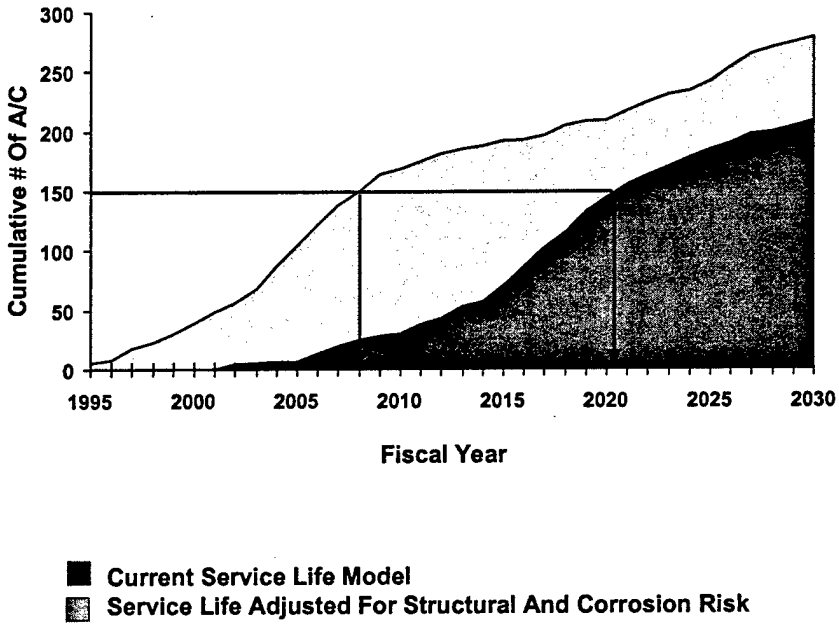


Figure 8. C-130 Current Service Life Model (HQ AMC/XPY, 13 Jan 1998)

C-130J-30 Training

The C-130J-30 aircrews can train almost exclusively for any of the possible tactical missions assigned to them. They dramatically increase the flexibility needed to successfully accomplish the securing of a lodgment. The oldest active duty C-130 models are located at Pope AFB. If the new C-130J-30s replace the current C-130s at Pope AFB on a one-for-one basis, the Air Force would have 45 C-130J-30s on station. Locating the aircraft with the 82nd Airborne has many advantages as well. Training costs are reduced because the Army or AMC does not have to pay for aircraft shuttling back and forth from home station or the cost of lodging the aircrews during exercises. The fact that aircrews and support personnel can support the Airborne missions without deploying away from their families could also improve aircrew retention.

Operational costs are significantly lower with the C-130J-30 than those of the C-17 performing the same training exercise. The cost per flying hour for Joint Airborne Training for the C-130J-30 is $1,050 versus $7,765 for the C-17 (HQ AMC/DOT, 29 May 1998). Since both aircraft carry almost the same amount of paratroopers (102 for C-17, 92 for C-130J-30) the cost per paratrooper per hour for the Army drops from $76.11 to $11.41 (80% lower). Figure 9 shows the training cost reduction for Joint Airborne/Air Transportability missions using the C-130J-30 versus AMC's other airlift assets. Using on-station C-130J-30s, the Air Force would not have to bring in maintenance and spare aircraft from their home units to support the Army's large exercises. By co-locating the airlift assets with the 82nd brigade on alert, the Air Force will always have assets readily available to launch within 18 hours of notification. The improved readiness alone more than makes up for longer flying times to the objective.

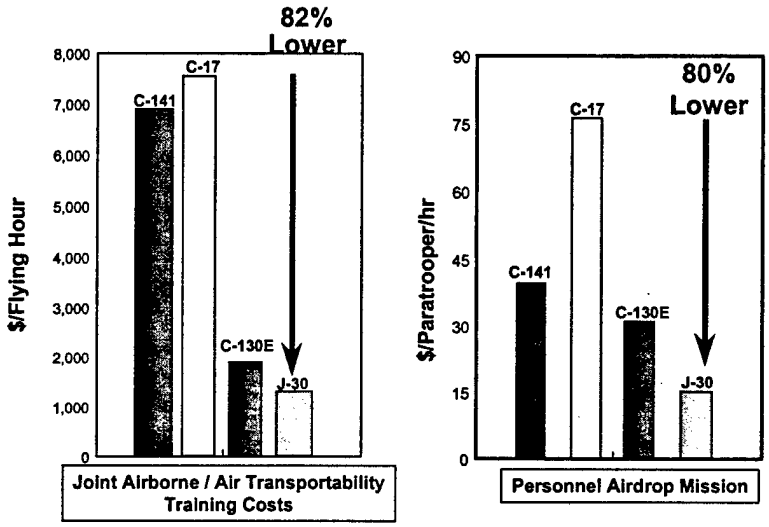


Figure 9. Airlift Training Costs For JA/ATTs (Girtman, 1998)

The Air Force can dramatically improve the training tactical crews receive with the C-130J-30. The C-17, like the C-5 and C-141, is primarily designed to provide strategic airlift for the US military. The tactical mission is an additional qualification that portions of the aircrews in each squadron obtain. The C-130J-30, like its predecessors, would primarily provide tactical support (airdrop and air assault) and as a secondary role, augment the airlift force flying the strategic mission. With significantly lower training costs, the Air Force could use the savings to incorporate tanker and ABCCC assets during exercises to create more of a "train like you fight" attitude.

C-130J-30 and the Principles of War

The C-130J-30, with its superior ability to drop personnel in large formations, improves the principles of offensive, mass, security, and simplicity from an all C-17 force.

Offensive and Mass: Using the C-130J-30 to drop the parachute assault force greatly improves the principles of offensive and mass. In the same amount of time, the C-130J-30 can deliver six times the number of paratroopers than the C-17 (mass). The Airborne forces have a better opportunity to seize the initiative (offensive) since the C-130J-30 fleet can drop the entire 2,448 paratroopers in under 10 minutes versus 24 minutes for the C-17.

Security: The principle of security also improves when the C-130J-30 is included in the SBA mission. The tighter formation geometry reduces the vulnerability of US forces over the objective by shortening the overall time from the first aircraft to the last by as much as two-thirds (Salice and Thayne, 1997). The C-130J-30 can drop paratroops

as low as 500 feet compared with 800 feet minimum altitude from the C-17, improving the security of the paratroopers by allowing them to reach the drop zone faster (33rd Test, 1997).

Simplicity: The principle of simplicity is adhered to with the incorporation of the stretch C-130J. Using 27 C-130J-30s dropping personnel and 24 C-17s dropping heavy equipment/CDS require fewer tankers enroute to the objective and none should be required after the airdrop is accomplished. Not requiring the air refueling planners to set up anchor points for over twenty airlift aircraft close to the objective greatly simplifies the planning process. Not only must the planners deconflict their anchor points with the tanker anchor points used for fighter/AWACS/ABCCC support, they must also devise plans for the airlift assets that fail to receive fuel after dropping the paratroopers.

Maneuver and Surprise: By moving the responsibility of delivering the paratroopers from the C-17 to the C-130J-30, the Air Force also adheres to the principles of maneuver and surprise. The new C-130J-30 gives the Air Force another strategic airlift asset that guarantees our ability to move both the Alpha and Bravo echelon forces within the allotted time. Using the C-130J-30 to perform the personnel airdrop role would free up an additional 24 C-17s, lowering the total needed for the SBA mission to 72. With a 96% reliability rate, the Air Force would only have to provide 75 C-17s to support the airdrop. Basing the C-130J-30s at Pope AFB with the 82nd Airborne allows the US to respond quickly to a crisis and possibly without catching the attention of the media, enhancing the principle of surprise.

The advantages of using C-130J-30s over the C-17 go beyond formation geometry. The C-130J-30 was built to support the tactical mission. All C-130J-30s are

equipped with the latest station keeping technology, SKE 2000, an improved All Weather Air Drop System (AWADS), and two GPSs (Lowe, 1998). The aircraft does not require a zone marker (electronic device that allows the aircrew to guide their aircraft to the point-of-impact) on the drop zone to airdrop personnel/equipment in the weather. The improved airdrop capability and added flexibility make the C-130J-30/C-17 option much more efficient than the all C-17 airdrop option.

The LEP^{3}ArD

A new approach to providing a reliable, safe, and cost effective way of delivering airlift and airborne forces is the Low-G Extraction Personnel Platform for Precision Air Drop or LEP^{3}ArD for short. The LEP^{3}ArD system switches paradigms from a low altitude, single parachutist mentality to a high altitude, "Egg Carton" system that delivers a group of personnel intact to a specific location. The LEP^{3}ArD is a 20 x 7.3 x 9 foot platform that can hold 39 troops and their supplies. The platform is extracted from the aircraft using a combination of gravity and drogue chute. A pilot then guides the platform to a soccer field size drop zone using an on-board GPS for navigation and a steerable parachute as part of the Advanced Precision Air Drop System (APADS) for control (Acree, Dec 1997). The platform is designed to carry personnel by incorporating an energy absorbing system consisting of a stand-in harness attached to webbing which is then attached to the frame. During descent to the objective, the troops are shielded from the wind, weather, and small arms fire. The platform can be fitted with chaff and flares and each platform has weapon mount points for self defense (Acree, 1998).

The LEP^{3}ArD system provides numerous tactical advantages, to the warfighting CINCs, ground forces, and Air Forces. With release points eight to ten miles and 20,000

feet from the drop zone, the actual objective for the Airborne forces remains hidden from the enemy (Acree, Dec 1997). The silent arrival of the LEP^{3}ArD platforms also enhances the tactical surprise. The ability to land in small soccer-field size drop zones allows troops to arrive very close to their actual objective. The Airborne commander has the option to land the platforms simultaneously, sequentially, or a combination of both. With the gun mounts on each platform, the paratroopers can soften the drop zone by using suppressive fire prior to touchdown.

The warfighting CINC gains an advantage with the LEP^{3}ArD system. The steerable platforms allow the warfighter to shape the battlefield. The airlift movement requires far fewer tankers than with the conventional airdrop delivery methods. This allows tankers to support the airland aircraft or other strike packages. The advantage to the ground forces is that they arrive unannounced, on top of their objectives, in fighting order, mobile and with firepower ready (Acree, Dec 1997). The Air Force's advantage is that it can avoid attrition losses to anti-aircraft and hand-held surface to air missile threats, which simplifies the suppression of enemy air defenses (SEAD) task and allows the SEAD forces to focus primarily on radar threats. The removal of the low altitude ingress/egress allows for a quick recovery of airlift assets to augment other airland requirements.

Safety is always a major concern, especially with a new system that makes radical changes to the current philosophy. The LEP^{3}ArD system is no exception. Extraction malfunctions are reduced because the platform will still exit the aircraft using gravity if the drogue chute fails. If the main chute encounters a malfunction during the drop, the reserve system is readily available. If operators become disoriented, the GPS can aid in

guiding the platform to the drop zone. To avoid possible collisions with other platforms on the way down, the pilots of each platform will wear night vision goggles. Manual disconnects prevent the LEP^{3}ArD from dragging across the ground if high surface winds are encountered on the drop zone (Acree, Nov 1997).

To deliver an Airborne brigade, suppose the US had the LEP^{3}ArD system for deploying paratroopers instead of the traditional method. AMC would bring in C-17s to load up heavy equipment platforms and the LEP^{3}ArD platforms. With dual-row capability, four LEP^{3}ArD platforms with a total of 156 troops can be loaded on a single C-17. The airlift force needed to drop the troops and equipment consists of 16 and 24 C-17s respectively. The 16 C-17s with the LEP^{3}ArD on board can depart as two-ship airland packages. This formation is practiced almost daily by all C-17 pilots and does not require special qualifications. The eight two-ship packages air refuel twice enroute to the objective. Twenty minutes from the release point, the aircraft begin a descent down to 20,000 feet. The LEP^{3}ArD pilots begin checking electrical and oxygen systems while the troops assemble inside the platform, begin strapping into the harnesses, and donning their oxygen masks. The loadmaster depressurizes the airplane and prepares the cargo compartment for the drop. During the run-in, the LEP^{3}ArD's electrical and oxygen systems are switched from the C-17 to the on-board supply system. Just prior to the release point, 16 drogue chutes begin to deploy from 16 C-17s and the loadmaster's on each aircraft report that all systems are "normal". The pilots, using the mission computers on the C-17, fly the aircraft to within meters of the release point and the green light is displayed. Simultaneously, the drogues pull ring-slot parachutes from the C-17 cargo ramps; the ring-slot chutes inflate and the first platforms begin to roll toward the

open doors. The first platforms exit, taking the drogue chute for the second platform into the air stream. The process is repeated for all four platforms on all sixteen C-17s (Acree, Dec 1997).

Shortly after the platform departs their main parafoil deploys. The sky is quickly filled with 64 platforms silently moving towards their objective. Passing 13,000 feet, the troops drop and stow their oxygen masks. The LEP^{3}ArD pilot, on NVGs, depletes the remainder of the oxygen system while steering his platform away from the other 63 around him. Windows are opened, machine guns are mounted, and a soldier, with an anti-armor weapon, takes up a position in the upper hatch of the LEP^{3}ArD to provide addition firepower if needed. Once the LEP^{3}ArD lands on the drop zone, the quick release side panels fall to the ground, the paratroopers unstrap and disembark, the entire unit intact and ready to fight (Acree, Dec 1997).

Most weapon systems rarely become obsolete, they merely change form. The LEP^{3}ArD system is in fact an evolved form of the towed glider from World War II. The glider was an effective mobility platform employed in two major strategic seizures in 1944. Operation MARKET GARDEN glider operations achieved an overall 87% delivery success rate; on the first day, 431 out of 478 (90%) reached their desired landing zones. On the second day, 1152 out of 1203 gliders (96%) were successful (Tata, 1996). The LEP^{3}ArD system, with today's advanced technology, should be able to reach or exceed these numbers.

Training with the LEP^{3}ArD

The training environment for the Airborne and airlift forces will change dramatically with the LEP^{3}ArD. With our current traditional delivery method, there is a

need to maintain confidence and skill to overcome the unique problems the paratroopers encounter. The traditional method requires a vast number of procedures that the paratrooper must know inside and out to safely and successfully drop from the aircraft, land on the drop zone, and quickly assemble into specific fighting units. The LEP^{3}ArD system, on the other hand, does not require the paratrooper to master a large number of procedures. The training can be divided between the pilots of the LEP^{3}ArD and the troops on board. The pilots will receive extensive simulator training followed by a couple of actual drops for confidence and certification. Once certified, a major portion of the currency requirements will be accomplished in the simulator. The troops can accomplish all their training in mock containers or in the simulator. Training could also consist of troops, loaded in a LEP^{3}ArD platform, pulled by a truck to a particular drop zone where they can practice their descent, landing and exit procedures and then assault their unit objective nearby. The training would be more effective since it focuses more on the assault of the unit objectives (in concert with other units) and less on overcoming the hazards of the delivery method (Acree, 1998). During joint exercises, entire units would perform actual drops in regiment or brigade-sized actions. Overall, the training would be less expensive than keeping thousands of paratroopers current with monthly drops. The savings in training costs would more than make up for the cost of buying the containers (around $500,000 apiece) (Acree, 1998).

LEP^{3}ArD and the Principles of War

The LEP^{3}ArD improves not only on the principles of war that are not adhered to by the C-17, but it also enhances our capability with the principles of unity of command and economy of force.

Offensive: The LEP^{3}ArD improves the principle of offensive because all the paratroopers could reach their designated areas at the same time. It allows the Airborne forces to possibly seize the initiative sooner because time won't be wasted gathering the troops at the rallying points. The multiple drop zones that are now available with the LEP^{3}ArD allow the military to act rather than react by dictating the place, scope, purpose, and pace of operations. If the Airborne forces can secure the lodgment in a shorter time period, the Bravo echelon forces can begin arriving and we can continue seizing the initiative and force the enemy to react to us.

Mass: The LEP^{3}ArD, using multiple release points, can deliver the entire brigade (2,448 paratroopers) in less than one minute versus 24 minutes for the C-17 traditional airdrop. The significantly reduced delivery time allows the US to put more mass on the objective.

Security: The LEP^{3}ArD system dramatically increases the security of the airlift forces which in-turn helps the Airborne forces. The high altitude release neutralizes many of the small arms and hand-held SAM threats that are difficult to suppress in support of the traditional airdrop delivery. Even though some of the most modern hand-held SAMs can reach 20,000 feet, the extra altitude gives the aircrews more time to react to the threat and to deploy countermeasures.

Simplicity: The LEP^{3}ArD system, unlike the traditional airdrop method, requires little training or coordination with airlift forces. The aircrews do not have to be specially qualified to accomplish the mission, and because they do not have to fly a low level route, the amount of time studying the route and coordinating with other assets in the area is reduced. The high altitude profile reduces the number of tankers that would normally

be required to support the traditional airdrop mission. The LEP^{3}ArD places a majority of the mission planning and execution in the hands of the Airborne pilots operating the system.

Maneuver: The steerable parafoils allow the paratroopers to maneuver themselves to shape the battle in their favor. The paratroopers exiting the aircraft at 800 feet above the ground have little or no capability to maneuver themselves to specific areas, they must move to their objectives once they hit the ground. The LEP^{3}ArD reduces the number of C-17s that would be required to move the Alpha echelon allowing AMC to provide additional support for the follow-on forces.

Surprise: The LEP^{3}ArD system silently delivers Airborne forces to the objective area, where as the traditional method relies on large aircraft, flying low and slow, to deliver the Airborne forces one aircraft load at a time, usually in a large clearing somewhere close to the objective. The silent arrival of the LEP^{3}ArD platforms on small landing zones allow the US military to land forces in a time and place for which the enemy is not prepared, thus enhancing the principle of surprise.

Unity of Command and Economy of Force: The LEP^{3}ArD delivery also improves on the principles of unity of command and economy of force compared with the traditional airdrop delivery methods. The unity of command overall does not change from the LEP^{3}ArD system to the traditional airdrop but the small unit commanders do have more control of their troops when they all arrive together at the objective not strung out across the field. The traditional airdrop procedures have built into the force structure an attrition rate of 20% prior to assembling at the objective. The LEP^{3}ArD, with its silent arrival and armor plating to protect the troops during the descent to the objective, should

reduce the attrition rates substantially. With a smaller attrition rate, the Airborne commander can afford to send a smaller number of troops and still have the same amount of firepower available to engage the enemy.

V. Conclusion

Our military leaders have shown, through Joint Vision 2010 and Army Vision 2010, that the brigade airdrop is a vital "forcible entry" capability for the United States. The Air Force faces many challenges as it decides how to support a strategic brigade airdrop mission. The reduction of forces and infrastructure overseas has put more emphasis on accomplishing the brigade airdrop from the continental United States (strategic airlift). With the imminent retirement of the C-141 fleet, the Air Force simply does not have the strategic airlift assets available to effectively support a strategic brigade airdrop.

While the C-17 is an outstanding airland and heavy equipment platform, the likelihood that concurrent missions (Special Operations and JCS alert launch) will also require C-17 aircraft creates a shortfall of C-17s to perform the SBA mission. Further, the wake vortices it produces prevent it from efficiently dropping personnel, violating the offensive, mass, security, and surprise principles of war. The worldwide use of small portable threats, which are difficult to find and neutralize, continues to increase. The larger spacing between C-17 elements results in aircraft flying low and slow for a longer period of time, increasing the probability of aircraft damage/loss or paratrooper casualties. If the US was establishing an airhead at an airfield with relatively little or no threat, then we could just airdrop in a small ranger battalion, let them secure the airfield and bring in the remaining force via airland. The problem occurs when the US needs to establish an airhead at a location where the threat is medium to high. The current method of delivering the Airborne forces into battle may be unsound (Acree, Nov 1997). The time has come to look at other possible alternatives to get the soldiers to the fight.

This paper presented two alternatives to enhance the support the Air Force must provide for a SBA. First, if the United States is determined to maintain the traditional approach of delivering Airborne forces, we need to acquire C-130J-30s that have an air refuelable capability to perform the personnel airdrop mission. The acquisition of the C-130J-30 would significantly reduce training costs for airdrop missions and allow additional C-17s to support AMC's airland requirements. Although the C-130J has a slower airspeed than that of a C-17, locating it with the 82nd Airborne at Pope AFB should easily make up for extended enroute flying time. Procuring the C-130J-30 for the SBA mission improves the principles of offensive, mass, security, simplicity, maneuver, and surprise for the US military.

The second alternative, the LEP^{3}ArD, presents a major shift in the paradigm from how airdrop is conducted today. With the ever-increasing threats from small arms, hand-held SAMs, and even helicopters, the LEP^{3}ArD offers the US military the opportunity to achieve our leader's vision effectively and efficiently. The LEP^{3}ArD system can dramatically improve the principles of offensive, mass, security, simplicity, maneuver, and surprise for SBA missions over the current C-17 force. The system also improves the unity of command and economy of force principles of war over the traditional airdrop delivery of personnel.

Developing a plan, training to it, and employing state of the art technology enables today's Airborne brigades to be a credible asset for the Joint Force Commander. As enemy forces realize that US forces cannot effectively intervene without a secure lodgment, the first order of business for Joint Force Commanders will be to gain access to a theater of operations. The Air Force must be able to effectively support the "Forcible

Entry" option chosen by the Joint Forces Commander. The Air Force can dramatically increase the flexibility of the Airborne forces by procuring the C-130J-30 as a strategic airdrop aircraft. With the acquisition of the LEP^{3}ArD system when it becomes available, the US military capability to secure a lodgment from an enemy increases dramatically. Finally, the Air Force must insure adequate training occurs using all aircraft (tankers, AWACS, and ABCCC) involved in the SBA mission.

The Air Force and Army should continue to research both traditional and new delivery methods to improve their capability to support a SBA mission. If the LEP^{3}ArD system is approved to deliver the 82nd Airborne during a SBA, the Army should research what equipment could be removed/replaced from the airdrop force. Once equipment requirements are determined, the Air Force and Army should research high altitude equipment delivery platforms that can further enhance the LEP^{3}ArD capability.

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Vita

Major Rob Jacobson was born on 29 April 1963, in Princeton, New Jersey. He graduated from Ames High School in Ames, Iowa in 1981 and entered undergraduate studies at Iowa State University. He graduated with a Bachelor of Science degree in Chemical Engineering in 1985.

In 1986, he was commissioned from Officer Training School at Lackland AFB and attended Undergraduate Pilot Training at Reese AFB, Texas. His first assignment was flying C-141B Starlifters at Norton AFB, California. After a short tour in C-141Bs, he returned to Reese AFB as a T-38 instructor pilot. During his ATC assignment, he served as a Flight Commander and Assistant Operations Officer for the 54th Flying Training Squadron. In 1992, he went back to C-141Bs at Charleston AFB, South Carolina where he became heavily involved in the Special Operations mission. He served as a Flight Commander and Chief of Squadron Stan/Eval while in the 16th Special Operations Squadron and as a Wing Stan/Eval pilot for the 437th Airlift Wing.

In June 1997, Major Jacobson was assigned to the Air Mobility Warfare Center as a student in the Advanced Study of Air Mobility (ASAM) program. After graduation, he will work in the J-3 section of USTRANSCOM.

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The purpose of this paper is to examine the Air Mobility Command's (AMC) ability to support a strategic brigade airdrop (SBA). A review of joint doctrine shows a continued reliance on the Airborne mission as a viable "Forcible Entry" option, yet AMC faces many problems meeting the needs of the Airborne forces and SBA mission. The imminent retirement of the C-141 aircraft coupled with the significant airdrop limitations of the new C-17 aircraft have severely hampered AMC's ability to support the SBA mission. Using the principles of war as guidelines, I present two options that improve AMC's ability to effectively support Airborne forces. The first option maintains the traditional approach to delivering Airborne forces to their objective by employing the new C-130J-30 aircraft. The "stretch" C-130J with the addition of an air refueling receptacle has the capability to deliver the Airborne forces to their destination more effectively than a C-17 fleet. Further, the addition of the C-130J to AMC's airlift fleet allows more C-17 assets to support other concurrent operations.

The second option discards the traditional delivery method and takes an "out-of-the-box" approach to solving the strategic airdrop dilemma. This option involves dropping a platform from high altitude with the Airborne forces inside by using the Low-G Extraction Personnel Platform for Precision Air Drop (LEP3ArD). This system provides a reliable, safe, and cost effective way of delivering Airborne forces into the objective area. Further, unlike the traditional airdrop methods, the LEP3ArD system requires little training or coordination with airlift forces, dramatically increasing the flexibility of the Airborne forces.

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